



Attorney Docket No. 48699-CPA (71360)

#16/Response
3/19/01
H. Butth

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

APPLICANT: H. Sato, et al

EXAMINER: C. Chaney

U.S.S.N.: 09/155,635

GROUP: 1745

FILED: July 9, 1999

FOR: LITHIUM ION SECONDARY BATTERY

Assistant Commissioner for Patents
Washington, D.C. 20231

CERTIFICATE OF MAILING/TRANSMISSION (37 C.F.R. 1.8(A))

I hereby certify that this paper (along with any paper referred to as being attached or enclosed) is being deposited with the United States Postal Service on May 14, 2001, in an envelope as first class mail addressed to the Assistant Commissioner for Patents, Washington, D.C. 20231.

By

Norah C. Sullivan

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Sir/Madam:

RESPONSE

The undersigned would like to express his appreciation to Examiner Chaney for the courtesies extended during a telephonic interview on May 10, 2001, in connection with this case. The various rejections and comments in the Office Action of February 12, 2001 were discussed, as further discussed below.

Applicants believe that no extension of time is required since this response is being filed before the expiration of the specified time period. Applicants, however, conditionally petition for an extension of time to provide for the possibility that such a

petition has been inadvertently overlooked and is required. As provided below charge Deposit Account No. **04-1105** for any required fee.

The specification has been objected to under 35 U.S.C. § 132 because the addition of the units of $\text{m}^2/\text{g } \mu\text{m}^{-.62}$ to the number '42' in the equation $y = 42x^{-.62}$ does not appear to be supported by the application as originally filed. The objection is respectfully traversed.

As discussed with Examiner Chaney on May 10, 2001, the units $\text{m}^2/\text{g } \mu\text{m}^{-.62}$ are explicitly present in the discussion of the equations " $y = 42x^{-.62}$ " and " $y = 52x^{-.62}$." More specifically, on lines 8 and 9 of Claim 1 as originally filed, the units for surface area (y) and particle size (x) are defined as m^2/g and μm respectively. The units $\text{m}^2/\text{g } \mu\text{m}^{-.62}$ for the coefficient C are simply determined by rearrangement of Formula II. For example, dividing both sides of the equation by $x^{-.62}$ gives the equation $C = y/(x^{-.62})$. The units of m^2/g for y and μm for x are specified in the application as filed. Thus, the units for the coefficient C (or number 42) are supported in the specification as $\text{m}^2/\text{gm } \mu\text{m}^{-.62}$. No new matter has been introduced. It is respectfully submitted that the new matter rejection should be withdrawn.

Claims 1, 3, 9 and 10 stand rejected under 35 U.S.C. 112, first paragraph, as containing subject matter which was not described in the specification. The rejection is respectfully traversed.

As discussed for the rejection under §132, the addition of the units $\text{m}^2/\text{g } \mu\text{m}^{-.62}$ to the number '42' is explicitly supported by claim 1, lines 15 and 16 of page 6 and throughout the application as filed.

Claims 1, 3, 9 and 10 stand rejected under 35 U.S.C. § 102(b) as being anticipated by Omaru et al. (U.S. Patent 5,561, 005) with evidence shown by Omaru et al. (U.S. Patent 5,639, 575) and Fauteux (U.S. Patent 5,512,392). The rejection is respectfully traversed.

The Office action states that LONZA KS 75 graphite has a particle size of 28.4 microns and a surface area that is *less than about* 7.65 m²/g. The Examiner appears to have determined this surface area requirement by extrapolation from data presented in Table 1 of Fauteux for other LONZA KS graphites. Table 1 of Fauteux is reproduced below. Applicants note that the particle size and surface area measurements presented in Table 1 of Fauteux are similar to the measurements determined by Dr. Sato and presented in the Declaration of December 20, 2000. The experimentally obtained data for LONZA KS 75 presented in the Declaration should be significantly more accurate than the approximated surface area value obtained by extrapolation of Fauteux.

TABLE 1 of Fauteux (U.S. Patent 5, 512,392)

Sample	Diameter (particle size) (μm)	Surface area (m ² /g)
LONZA KS 6	3.34	22
LONZA KS 25	10.5	13
LONZA KS 44	20.25	10

In comparison to Fauteux, the Declaration of Sato submitted on December 20, 2000, provides both surface area and particle size measurements for the series of LONZA graphites. The Declaration further provides the techniques and instrumentation used to calculate the surface area and particle size. The measurements presented for two shipments of the same lot of LONZA KS-25 graphite presented in Table 2 suggest that there is minimal systematic error present in the measurements presented in Table 1 and Table 3 of the Declaration. The lot-to-lot error for LONZA KS-44 is presented in Table 3 of the Declaration. Tables 1-3 of the Declaration are reproduced below.

TABLE 1 of Declaration

	Particle size	Specific surface area
LONZA KS 6	4.9 μm	22.0 m^2/g
LONZA KS 15	8.0 μm	12.5 m^2/g
LONZA KS 25	10.1 μm	11.9 m^2/g
LONZA KS 44	17.5 μm	9.2 m^2/g
LONZA KS 75	23.7 μm	7.2 m^2/g

TABLE 2 from Declaration

Grade	LONZA KS 25	
Lot No.	G-287	G-287
Shipment Date	February 5, 1993	June 28, 1995
BET surface area (m^2/g)	11.9	11.9
Particle Size (μm)	10.1	10.0

TABLE 3 from Declaration

Grade	LONZA KS 15		LONZA KS 44			
Lot No.	G-346	H-258	H-036	G-148	I-066B	L-041B
BET surface area (m^2/g)	13.7	13.4	9.5	8.4	9.2	9.1
Particle size (μm)	8.0	8.0	19.0	16.0	17.5	18.8

Applicants note that no combination of measurements for LONZA KS-75, either experimentally obtained measurements or extrapolated measurements, satisfy the requirements of the instant invention.

As discussed with the Examiner on May 10, 2001, the statement in the last response that the lot-to-lot deviation in particle size and specific surface area was 10% was an over-generalization, which cannot stand in the light of the measurements given in the declaration

itself. The statement that that the surface area and particle sizes have a 10% deviation was overly broad. The actual deviations are much smaller than that, as indicated in the declaration itself. In order to more accurately assess the experimental errors or deviation in particle size and surface area for LONZA graphites, error calculations are presented in Table A below. Error measurements are calculated by taking the difference between the average value and the individual data point. The average deviation in particle size across the four lots is about 1.1 microns, e.g., about 6.2 %. The average deviation in surface area across the four lots is about 0.33 m²/g, e.g., about 3.6%.

TABLE A: Error analysis for LONZA KS-44 surface area and particle size measurements.

KS-44 Lot No.	Particle Size (μm)	Deviation in Particle Size	Surface Area (m ² /g)	Deviation in Surface Area
H-036	19.0	1.2	9.5	0.45
G-148	16.0	1.8	8.4	0.65
I-066B	17.5	0.3	9.2	0.15
L-041B	18.8	1.0	9.1	0.05
Average	17.8	1.08	9.05	0.33

The deviation in the coefficient of Formula II, e.g., $y \leq 42x^{-0.62}$ or $y \leq kx^{-0.62}$, can be calculated by rearranging formula II to read:

$$k \geq \frac{y}{x^{-0.62}} \quad \text{Formula A}$$

Using the calculated deviations from Table A and Formula A, an approximation for the deviation in coefficient k can be determined by using the deviations in particle size and surface area as variables x and y. As shown in the calculation below the error in coefficient k is about 1%.

$$k \geq \frac{0.062}{0.036^{-0.62}} = 0.008$$

Even assuming a 10% error in both the surface area and particle size as inadvertently stated in the Declaration of December 20, 2000, the error in coefficient k is only about 2.4%.

The specification as originally filed provides a coefficient (42) for Formula II and the Declaration of December 20, 2000 provides an equation relating the surface area and particle size measurement of the LONZA graphites ($y = 52x^{-0.62}$).

The Examiner has suggested that the coefficients for the coefficient for graphites of the instant invention and the coefficient for the prior art graphites are not statistically different by applying a 10% deviation to the coefficients based on the 10% deviation in the surface area and particle size. As discussed above, the coefficient deviation is not the same as the deviations of the specific area and particle size, but must be calculated by inputting the deviations in particle size and surface area into the equation of Formula II and solving for the coefficient K. Using the coefficient deviations shown above, the coefficients for the graphites of the instant invention and prior art graphites are **significantly different** and the range of coefficients do **not** overlap. For example, using a 1% coefficient deviation as calculated from the data in Table A, the coefficient for graphites of the instant invention has a range of 41.6-42.4 and the coefficient for LONZA graphites has a range of 51.4 to 52.6. Even using a 2.4% coefficient deviation as calculated assuming a 10% deviation in particle size and surface area only results in coefficient ranges of 41-43 and 50.7-53.3. Clearly there is a significant difference between the coefficients for graphites of the instant invention and prior art graphites.

As provided in MPEP-2131, a claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference. *Verdegel Bros. v. Union Oil Co. of California*, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987). Or stated another way, "The identical invention must be shown in as complete detail as is contained in the ... claims." *Richardson v Suzuki Motor Co.*, 868 F.2d 1226, 9 USPQ 2d. 1913, 1920 (Fed. Cir. 1989). Although identify of terminology is not required, the elements must be arranged as required by the claim. *In re Bond*, 15 USPQ2d 1566 (Fed. Cir. 1990).

Here, however, the graphites of the instant invention are not disclosed, explicitly or inherently, in the prior art, and in fact they have distinct physical properties as compared to prior art graphites. More importantly, lithium ion batteries constructed using graphites of the present invention have substantially better performance characteristics than batteries constructed using prior art graphites such as LONZA KS graphites. Table B presents the data from Table 3 of the specification as filed. The batteries are prepared by analogous methods with the exception of the graphite used in the negative electrode. The data clearly shows the unexpected improved battery performance properties for batteries comprising graphites of the instant invention as compared to batteries having a prior art graphite. In particular, battery capacity at 2.8 mA/cm² improves by 20-25% at 2.8 mA/cm² and **battery capacity, at 5.6 mA/cm², improves by 130-140 %.**

TABLE B: Comparison of battery efficiency.

	Ex. 10	Improvement of Ex. 10 vs. C.Ex.7	Ex. 11	Improvement of Ex. 10 vs. C.Ex.7	Comparative Example 7
First Cycle Efficiency (%)	92		92		92
Doping Capacity (mAh/g)	350	10%	362	15%	315
Undoping Capacity (mAh/g)	342	11%	361	15%	314
Capacity at 2.8 mA/cm ² (mAh/g)	334	19%	348	24%	280
Capacity at 5.6 mA/cm ² (mAh/g)	300	131%	312	140%	130


Nothing in the prior art even hints at the possibilities of such improvements. It is respectfully submitted that the subject application is in condition for allowance. Early and favorable action is requested.

Applicants believe that additional fees are not required for consideration of the within Response. However, if for any reason a fee is required, a fee paid is inadequate or credit is owed for any excess fee paid, you are hereby authorized and requested to charge Deposit Account No. **04-1105.**

H. Sato, et al.
USSN: 09/155,635
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Respectfully submitted,

Date: May 14, 2001

By: 
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Attorney Docket No. 48699 CPA (71360)

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant: H. Sato, et al.
Serial No.: 09/155,635
Filed: July 9, 1999
For: LITHIUM ION SECONDARY BATTERY

Examiner: C. Chaney
Group: 1745

Box Non-Fee Amendment
Assistant Commissioner for Patents
Washington, D.C. 20231

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Washington, D.C. 20231

AMENDMENT TRANSMITTAL

1. Transmitted herewith is an amendment for this application.

STATUS

2. Applicant is
[] a small entity. A statement:
[] is attached.
[] was already filed.
[X] other than a small entity.

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CERTIFICATE OF MAILING/TRANSMISSION (37 C.F.R. 1.8(a))

I hereby certify that, on the date shown below, this correspondence is being:

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- [X] deposited with the United States Postal Service with sufficient postage as first class mail in an envelope addressed to the Assistant Commissioner for Patents, Washington, D.C. 20231.

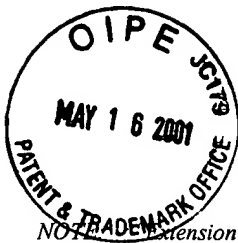
FACSIMILE

- ☐ transmitted by facsimile to the Patent and Trademark Office.

Signature

Date: May 14, 2001

Norah C. Sullivan.



EXTENSION OF TERM

NOTE: *Extension of Time in Patent Cases (Supplement Amendments) — If a timely and complete response has been filed after a Non-Final Office Action, an extension of time is not required to permit filing and/or entry of an additional amendment after expiration of the shortened statutory period.*

If a timely response has been filed after a Final Office Action, an extension of time is required to permit filing and/or entry of a Notice of Appeal or filing and/or entry of an additional amendment after expiration of the shortened statutory period unless the timely-filed response placed the application in condition for allowance. Of course, if a Notice of Appeal has been filed within the shortened statutory period, the period has ceased to run." Notice of December 10, 1985 (1061 O.G. 34-35).

NOTE: *See 37 C.F.R. § 1.645 for extensions of time in interference proceedings, and 37 C.F.R. § 1.550(c) for extensions of time in reexamination proceedings.*

3. The proceedings herein are for a patent application and the provisions of 37 C.F.R. § 1.136 apply.

(complete (a) or (b), as applicable)

(a) ☐ Applicant petitions for an extension of time under 37 C.F.R. § 1.136 (fees: 37 C.F.R. § 1.17(a)(1)-(4)) for the total number of months checked below:

	Extension (months)	Fee for other than small entity	Fee for small entity
<input type="checkbox"/>	one month	\$ 110.00	\$ 55.00
<input type="checkbox"/>	two months	\$ 390.00	\$ 195.00
<input type="checkbox"/>	three months	\$ 890.00	\$ 445.00
<input type="checkbox"/>	four months	\$ 1,390.00	\$ 695.00

Fee: \$.00

If an additional extension of time is required, please consider this a petition therefor.

(check and complete the next item, if applicable)

☐ An extension for _____ months has already been secured. The fee paid therefor of \$ _____ is deducted from the total fee due for the total months of extension now requested.

Extension fee due with this request \$ _____

OR

(b) ☒ Applicant believes that no extension of term is required. However, this conditional petition is being made to provide for the possibility that applicant has inadvertently overlooked the need for a petition for extension of time.



FEE FOR CLAIMS

The fee for claims (37 C.F.R. § 1.16(b)-(d)) has been calculated as shown below:

[Col. 1] [Col. 2] [Col. 3] Small Entity Other Than a Small Entity

Claims Remaining After Amendment	Highest No. Previously Paid For	Present Extra	Rate	Additional Fee	Rate	Additional Fee
Total 4	Minus 20	=0	x \$9 =	\$	x \$ 18 =	\$0
Indep. 1	Minus 3	=0	x \$40 =	\$	x \$ 80 =	\$0
[] First Presentation of Multiple Dependent Claim			+\$135 =		+\$270 =	
				Total Addit. Fee: \$	Total Addit. Fee \$0	

- * If the entry in Col. 1 is less than the entry in Col. 2, write "O" in Col. 3,
 - ** If the "Highest No. Previously Paid For" IN THIS SPACE is less than 20, enter "20".
 - *** If the "Highest No. Previously Paid For" IN THIS SPACE is less than 3, enter "3".
- The "Highest No. Previously Paid For" (Total or Indep.) is the highest number found in the appropriate box in Col. 1 of a prior amendment or the number of claims originally filed.

WARNING: "After final rejection or action (§ 1.113) amendments may be made canceling claims or complying with any requirement of form which has been made." 37 C.F.R. § 1.116(a) (emphasis added).

(complete (c) or (d), as applicable)

(c) [X] No additional fee for claims is required.

OR

(d) [] Total additional fee for claims required \$.

FEE PAYMENT

5. [] Attached is a check in the sum of \$ _____.
- [X] Charge Account No. 04-1105 the sum of \$ 0.00
- A duplicate of this transmittal is attached.

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FEE DEFICIENCY

NOTE: If there is a fee deficiency and there is no authorization to charge an account, additional fees are necessary to cover the additional time consumed in making up the original deficiency. If the maximum, six-month period has expired before the deficiency is noted and corrected, the application is held abandoned. In those instances where authorization to charge is included, processing delays are encountered in returning the papers to the PTO Finance Branch in order to apply these charges prior to action on the cases. Authorization to charge the deposit account for any fee deficiency should be checked. See the Notice of April 7, 1986, (1065 O.G. 31-33).

6. ☒ If any additional extension and/or fee is required, charge Account No. 04-1105.

AND/OR

- ☒ If any additional fee for claims is required, charge Account No. 04-1105.



SIGNATURE OF PRACTITIONER

Reg. No. 27,026

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